CLEAN ENVIRONMENT COMMISSION

INVESTIGATION OF SMOKE PROBLEMS FROM AGRICULTURAL CROP RESIDUE AND PEATLAND BURNING

REPORT ON PUBLIC HEARINGS

OCTOBER 20 TO DECEMBER 7, 1987

Manitoba

TABLE OF CONTENTS

		PAGES
1.	INTRODUCTION	1
	1.1 Peat Burning	2
	1.2 Crop Residue Burning	3
2.	BACKGROUND	4
	2.1 The Commission's Mandate	4
	2.2 Preparation and Conduct of Hearings	5
3.	PEAT	9
	3.1 Peat Land Development	9
	3.1.1 Recommendations	11
	3.2 The Burning of Peat	12
	3.3 The Best Time To Burn Peat	12
	3.3.1 Recommendation	14
	3.4 A Permit Sy For Peat Fires	15
	3.5 Administration of A Permit System	15
	3.6 Existing Fire Controls	18
	3.6.1 Recommendations	18
	3.7 Implementation of A Permit System	20
	3.7.1 Recommendation	20
4.	CROP RESIDUE	22
	4.1 Manitoba Department of Agriculture Position	22
	4.2 The University of Manitoba Position	24
	4.3 The Keystone Agricultural Producers Position	24
	4.4 Flax Straw	25
	4.4.1 Recommendation	25
	4.5 Other Non-Cereal Crops	26
	4.5.1 Recommendation	26
	4.6 Other Considerations	27
	4.7 Alternatives To Burning Straw	27
	4.8 The Burning of Cereal Grain Straw	28
	4.9 Control of Burning	29
	4.9.1 Recommendations	30
5.	HEALTH ASPECTS OF SMOKE FROM BURNING OF PEAT AND CROP RESIDUES	32
	5.1 Introduction	32
	5.2 Medical Positions	32
	5.3 The Manitoba Department of Health Position	34
	5.4 The Manitoba Environmental Council Position	35
	5.4.1 Recommendations	35
6.	LIST OF RECOMMENDATIONS	36
APPENDIX A - EXHIBITS OF THE HEARINGS		40

CHAPTER 1

INTRODUCTION

Smoke in the air during the fall season has been a common occurrence - one might say that it has been traditional - in both urban and rural areas of Manitoba.

Until recent years city residents commonly disposed of the fall harvest of leaves in backyard bonfires or in the ditches that drained the residential streets. Grass in these ditches was also burned as a means of providing good drainage the following spring and as a means of promoting spring growth of grass. This annual occurrence was generally accepted, except for complaints by people with respiratory problems and perhaps by those with laundry, hung out to dry on clothes lines. In addition, many urban dwellers burned unwanted combustible waste in backyard open fires, sometimes producing objectionable smoke in the process.

Times have changed. It is now known that smoke, even from such a seemingly benign source as the burning of leaves, is not healthy — even if the aroma does remind some senior citizens of the "good old days".

Environmental expectations have also changed in that formerly tolerated conditions are no longer acceptable. Prior to and even after World War II, the production of heat for residences and commercial buildings in Winnipeg and elsewhere in Manitoba, was largely by coal burning furnaces, and the virtual elimination of these since then has improved the quality of the winter air to a significant degree. Industries emitting smoke and other pollutants have been placed under environmental regulatory orders which have controlled and reduced such pollution. Automobiles exert a major influence on air quality in urban areas; however, federal legislation under the Clean Air Act now limits emissions in new vehicles, and emission levels will be further reduced shortly. Lead in gasoline has been reduced and leaded gasoline is being phased out. Many cities, including the City of Winnipeg, have also passed by-laws prohibiting open fires. The urban atmosphere is not yet pollution free but it is clear that much has been accomplished in keeping pollution under control in response to the now prevalent expectation that reasonably unpolluted air is a right of all citizens, urban and rural alike. This current expectation has been expressed on the occasions in the late summer and fall when smoke from agricultural burning in nearby rural areas has affected the City of Winnipeg.

It may be said safely that people living in rural areas generally enjoy a considerably better quality of air than do their urban neighbors. They are not subjected to the same concentration of industrial air pollution, exhaust from motor vehicle emissions, and even smoke from fireplaces and wood stoves that is commonplace in the cities. Indeed, a considerable number of former city dwellers who commute to work in the city have moved to the country to enjoy the benefits that country living provides, including pollution free air.

1.1 Peat Burning

The burning of peat soil is another, although considerably different, tradition of farm burning in the eastern area of the Province where this soil is prevalent. Unlike prairie land, peat soils in their natural state are generally covered with brush, forest growth, or bog. When these lands are cleared for agricultural purposes, the brush and small trees are usually burned. The surface peat removed with the roots burns too, if it is dry enough. If generally dry conditions exist, the underlying organic peat soil may also burn.

While the farming of specialty crops can be carried on successfully on peat land, there is a limited market for these crops. Cereal grain crops can also be grown on peat soil but there are some problems in doing so. Over the years since farming on peat soils in Manitoba commenced, a considerable amount of peat land has been cleared and converted for conventional farm production, i.e., the growth of cereal crops. In this process, not only have clearing operations resulted in the burning of peat but, also, additional layers of peat have been removed by burning in order to improve the land for conventional farming practices. The entire peat cover has been burned off in some areas, right down to the underlying mineral soil. Unlike straw fires, the peat fires may burn for days, weeks, or months __ sometimes even all winter __ depending on weather and soil conditions.

Few citizens of towns and communities in rural areas affected by smoke from straw fires protested to the Commission. In contrast, citizens of communities in the areas where peat is still burned for land clearing or farm improvement purposes were very vocal in their opposition to peat fires. Such smoke may be present for long periods of time, causing much discomfort, possible health concerns, and highway traffic disruption.

Agricultural burning practices have caused concern in rural areas in both peat and mineral soil regions of the Province because of the traffic hazard that is created when smoke blankets highways, sometimes reducing visibility to zero. Many motor vehicle accidents and several fatalities attributed to this hazard have occurred in Manitoba in recent years. Most of the serious accidents have been associated with smoke from peat fires (one occurring near Lac du Bonnet in September, 1987). The previous year, however, a straw fire in North Dakota resulted in a multiple vehicle pile up and two deaths (including one Manitoban). In the fall of 1987, smoke from agricultural burning in Alberta caused two multiple vehicle accidents with fatalities.

1.2 Crop Residue Burning

In rural areas, the fall burning of farm crop residue has been a well established practice. Many farmers believe that burning is an economic and practical necessity for selected crop residues and under such conditions as late harvest and wet weather. The burning of straw, surplus to farm requirements, and even straw stubble, has been a practice that probably predates the introduction of the combine harvesting machine; however, its use resulted in the spreading of straw over farm fields rather than depositing it in a straw stack beside the threshing machine. Burning was an easy way to remove unwanted straw.

Burning practices have changed in recent years along with harvesting equipment and methods. Today a field purposely "burned black" is an uncommon occurrence. When straw is burned, the usual practice is to burn only the windrows of straw left behind the combine and to retain the standing stubble. The incorporation of standing stubble and straw back into the soil requires that the straw be chopped and spread behind the combine, and is recognized as an agronomically and economically beneficial practice by most farmers and agricultural experts. This practice reduces erosion, increases fertility, improves soil tilth, and increases water holding capacity. The ongoing reduction in the frequency of crop residue burning indicates acceptance of this approach. Notwithstanding, there is still considerable burning being practiced for a variety of reasons.

Several of the municipalities surrounding the City of Winnipeg are among those that have the highest incidence of crop residue burning, and this leads to the occurrence of smoke in this City.

The foregoing is a brief outline of the practice and results of farm burning that have led to the Clean Environment Commission's hearings and the considerations with which it has been confronted in the development of this report.

CHAPTER 2

BACKGROUND

2.1 The Commission's Mandate

On June 12, 1987, the Honourable Gerard Lecuyer, Minister of the Department of Environment and Workplace Safety and Health, requested that the Clean Environment Commission hold hearings to investigate concerns and problems caused by smoke from the burning of crop residue (commonly referred to as stubble burning). The Minister's letter of request advised that the Environment Department had received numerous complaints about this smoke every fall and that most of the complaints originated in the City of Winnipeg on occasions when crop residue was being burned in nearby areas. Some concerns had also been raised in rural areas, particularly related to reduced highway visibility. The Minister asked that the Commission set its own terms of reference — to include health and safety aspects of the practice — and requested that recommendations be made on how such burning could be controlled, if this was considered to be necessary.

The subject of farm burning had received some earlier attention and debate in the Manitoba Legislative Assembly during consideration of the Environment Department estimates and, on that occasion, the Minister had stated his intention to ask the Commission to hold investigatory hearings on this problem.

The Commission planned the hearings to commence following the completion of farm harvest operations to ensure an adequate opportunity for the examination of smoke related concerns including the views of farmers on the need to burn crop residues. It was considered essential that the farming community be able to participate fully in the hearings.

The Clean Environment Commission had previously conducted hearings on farm burning practices from December of 1976, to February of 1977. In July, 1977, the Commission submitted a report with recommendations to the then Minister of the Department of Mines, Resources and Environmental Management. This report found that the burning of peat was the major cause of the smoke problems experienced at that time. No current members of the Commission were involved in the earlier hearings.

The Commission developed its terms of reference and a plan to hold a total of eight hearings, six in rural communities surrounding and relatively close to Winnipeg - the source of the majority of complaints - plus a hearing in western Manitoba (Brandon) and a two day hearing in Winnipeg.

The matter of addressing smoke from burning on peatland had not been a part of the Minister's request to the Commission, although this problem was a main thrust of the previous 1976 hearings and report. Therefore, no hearings were initially planned to be held in Eastern Manitoba. In mid September, however, the Commission received a request from the Council of the Rural Municipality of Lac du Bonnet to hold a hearing there so that concerns

regarding smoke from peat fires could also be heard and considered. Subsequently, on September 24th, a traffic fatality occurred on PTH #11 near Lac du Bonnet, and smoke from burning peatland was cited as a major contributing factor.

With the concurrence of the Minister, the Commission extended its terms of reference to include the burning of peatland, and, after consultation with municipal officials in the region, scheduled additional hearings in Lac du Bonnet and Whitemouth.

Finally, at the request of the Council of the Rural Municipality of Russell, and after consultation with other municipal officials in the area, the Commission held a hearing on December 7, 1987 in the Village of Rossburn, to address the burning of crop residue in that area.

2.2 Preparation and Conduct of Hearings

The Commission developed the following terms of reference for the hearings:

1. The nature and extent of agricultural burning practices in Manitoba including stubble, straw and other crop residue and peat fires. (Note: "peat fires" added later)

2. Transportation (highway, airport) and safety implications of smoke from burning.

3. Health Implications of burning in farm and non-farm communities.

4. The Agronomic pros and cons of burning, i.e., the necessity and desirability of agricultural burning from an agronomic, economic and farm management point of view.

5. The environmental effects of burning, i.e., the impact on wildlife, soil fertility and soil conservation.

6. Laws and regulations related to burning: those that are in place and those that may be needed in the public interest and whether they should be provincial or municipal.

7. Weather forecasting and atmospheric conditions and their possible utility in mitigation of the undesirable effects of smoke from burning.

8. Alternatives to burning: the education/extension role of the Manitoba Department of Agriculture, the University of Manitoba Faculty of Agriculture, farm organizations and other public interest groups.

The terms of reference were distributed to municipal councils throughout the province in August prior to the scheduling of actual hearing places and dates in order to provide advance notice of the coming hearings. They were also sent to other organizations which were considered to have an interest in these hearings, e.g., The Keystone Agricultural Producers, the Manitoba Lung Association, the Manitoba Department of Health, the Royal Canadian Mounted Police, and the Manitoba Environmental Council. A number of other individuals and organizations were also contacted by telephone.

The original eight hearing dates and locations were chosen in September. This information was relayed to all those previously contacted, including all those people who had registered complaints with the Minister and the Department. The hearings were also advertised in newspapers serving the areas of the hearings.

Following the extension of the Commission's terms of reference to include the burning of peat, municipalities and interested parties in the Eastern Region were notified of the Lac du Bonnet and Whitemouth hearings and the hearings were advertised in Winnipeg and rural newspapers. After addition of the last hearing at Rossburn, municipal councils in that area were advised and the hearing was advertised in area newspapers.

The total of eleven hearings were held as follows:

Place	Date
Grosse Isle	October 20, 1987
Oak Bluff	October 23, 1987
Niverville	October 26, 1987
Brandon	October 27, 1987
Dugald	October 30, 1987
Winnipeg	November 2-3, 1987
Carman	November 4, 1987
Elie	November 5, 1987
Whitemouth	November 30, 1987
Lac du Bonnet	December 2, 1987
Rossburn	December 7, 1987

All hearings were very well attended with submission of both written and verbal briefs and with active participation in the questioning period which followed presentations.

The rural hearings in the proximity of Winnipeg commenced at 10:00 a.m., and were attended largely by farm people and members of municipal councils. Presentations were also made by expert witnesses, for example, the Atmospheric Environment Service of Environment Canada and the Royal Canadian Mounted Police, and citizens' organizations, such as the Manitoba Environmental Council and the Women's Institute. The farmers and municipal councillors, with a few exceptions, defended the reasons and perceived necessity to burn selected crop residues and expressed their desire to be able to make this choice without legislated controls.

The hearing at Brandon was held at 2:00 p.m. and continued at 7:30 p.m. in the evening. The afternoon session was well attended by farmers and municipal councillors with very active participation. A presentation was also made by a representative of the Agriculture Canada Research Station at Brandon. Prior to the hearing, the City of Brandon had advised the Commission that smoke from the burning of farm crop residue was not a problem and that the City, therefore, did not intend to make a presentation. A lack of any significant attendance or participation by citizens of Brandon was a validation of this position.

The hearing at Winnipeg commenced in the evening at 7:30 p.m., and continued the following morning at 9:30 a.m., to facilitate participation by all interested parties. The majority of attendees and participants were citizens of Winnipeg who expressed concerns about and opposed the practice of burning crop residue for a variety of explanations and reasons. A considerable number of farmers and municipal representatives attended to explain their reasons for the practice and participate in the question periods. The Winnipeg hearing also provided the forum for presentations by four representatives of the medical profession with regard to health related aspects of smoke - one from the respiratory clinic of the St. Boniface Hospital, one from the respiratory clinic of the Health Sciences Centre, and two representing the Manitoba Department of Health.

The evening hearing at Whitemouth shifted the focus of the hearings almost entirely to the matter of the burning of peat land and the problems generated by this practice. The large majority of attendees were farmers and municipal councillors who explained their reasons for burning and their concern about possible restrictive controls. There was also some input from organizations and individuals concerned with the adverse effects of smoke from peat fires.

At Lac du Bonnet, the evening hearing dealt almost exclusively with peat burning practices and the resultant smoke problem. In this instance, participation was well divided between farming people, who explained their requirement to improve land for agricultural purposes by the burning of peat, and citizens of Lac du Bonnet and other nearby communities who voiced concerns about the problems created by peat smoke. For the most part, the latter participants advocated either stringent controls or outright prohibition of burning. A presentation was made by the local Royal Canadian Mounted Police centred on the traffic problems, hazards and accidents that have been

experienced in the Lac du Bonnet area. A presentation was also made by the chief of the fire control program of the Manitoba Department of Natural Resources, explaining the permit control system in place under the Fires Prevention Act for the designated "wooded district" of the Province which includes most of the peat land. The control measures, actions taken, and problems experienced were outlined.

At every hearing, the chief of the land utilization and soil survey section of the Manitoba Department of Agriculture was the first speaker, explaining the history and development of farm burning practices as well as the advantages and disadvantages involved. A modified paper was delivered at the hearing in peat areas to deal with the considerably different aspects related to farming on peat land.

At the request of the Commission, a representative of the weather forecasting service of Environment Canada made a presentation at several hearings. This presentation described the important effect weather can have on smoke generation and dispersion, showing what can occur in this regard under a variety of weather conditions, and explaining the weather forecasting services that are available to assist in choosing the optimum time to burn. He also presented an example of an area of the U.S.A. where farm burning created a smoke problem and organized group action combined with utilization of weather forecasting data had helped substantially to reduce this problem.

CHAPTER 3

PEAT

3.1 Peat Land Development

In examining the problems caused by smoke from peat burning practices, and possible controls, it may be instructive to look deeper at basic causes behind the issue. To ignore this aspect would leave us in the position of treating a symptom rather than dealing with the root cause of the problem.

Large areas of the land east of the Red River were, or still are, overlain by organic peat soil, sometimes up to a depth of several feet (a metre or two). Unlike the prairie grasslands, this peat land was generally covered with brush, forest growth, or bog and was undoubtedly not as inviting or as suitable for direct agricultural development as the prairie soil. However, peat lands occur in many parts of the world and support a variety of farming practices, and it was not long after prairie homesteading took place that the development of some of these peat lands for agricultural purposes began.

After clearing surface vegetation, brush, trees and roots from this land, the common practice for farm development by homesteaders was to remove additional peat by the practice of burning it *in situ* in years when the peat became dry enough to do so. While vegetables and forage crops grew well on the peat, cereal crops were at risk because the peat soil acted as an insulator preserving colder soil temperatures that, in effect, shortened the growing season and subjected the crop to damage by virtue of late spring germination and growth and early fall frost conditions. Because of this, the peat was completely burned off right down to mineral soil when prevailing conditions made it possible to do this. Many good grain growing farms exist today on what once was peat land, demonstrating the efficacy of this practice in areas where peat was underlain by good mineral soil.

This traditional method of peat farm land improvement has been carried on to this day, as the accepted practice by succeeding generations of farmers, although less peat is burned *in situ*. During present day land clearing operations, in order to dry peat to a burnable state, it is scraped from the surface along with the native vegetation and piled in windrows to dry. A change in the peat removal practice is that most farmers may wish to leave a foot or so (25-35 cm) of peat, which is then worked into the underlying mineral soil, thereby improving its tilth and overall quality.

Agrologists in the Manitoba Department of Agriculture and the Faculty of Agriculture at the University of Manitoba advocate the utilization of peat soil for agricultural purposes without removal of the peat beyond initial clearing operations. It is recognized that farming on peat soil is fundamentally different from farming on mineral soil and presents some problems and limitations. For some crops, peat soil evidently requires packing with heavy rollers to secure a proper seed bed. Even after packing, the peat soil is subject to wind erosion, especially before the crop has emerged. A different type of tillage equipment is also required.

Some garden vegetables, forage crops, and sod for landscaping can be grown exceptionally well on peat soil; however, there is obviously a limited market for such specialty crops. When cereal grains are grown, there is a recognized problem with regard to the shortened growing season and risk of damage by frost, as previously outlined.

The Commission understands that significant tracts of the extensive peat land resource of the Province, which are almost entirely Crown lands, have been designated "agricultural", as their best potential use, by the Provincial Land Use Committee. This evidently means that such lands can be and are leased or eventually sold to farmers for clearing and development into farms. Considering the limitations on peat soil for farming purposes and the current development or improvement practices, it must be taken for granted that not only will burning take place for land clearing but also additional peat will be burned off and drainage works constructed to make the land better suited for conventional grain farming.

It is no doubt true that the greatest potential for further agricultural development in the Province lies in the development of peat lands - indeed this may well be the Government's policy. **Inherent in the agricultural designation and development of these lands, however, must be the recognition that burning and the potential for production of smoke inevitability follows from this policy. Those who make the prevailing policy of developing peat land into farms must recognize that the policy results in the burning of the peat.**

While the generation of a great deal of smoke over an extended period of time might be acceptable in an uninhabited region, the residential tolerance to this condition has evidently worn thin in the populated areas of the Province where the burning of peat still takes place.

No doubt, alternative uses of peat land have been carefully considered by the Land Use Committee before designation of a use is made, including the potential for silviculture (possibly requiring some land improvement, such as drainage), wildlife habitat, recreational use, etc.

What beneficial use might be made of the peat soil itself as a resource? Its use as a fuel or a soil conditioner and a filter medium are well known but at the present time the economics of such uses appear not to permit large scale utilization of peat for such purposes. There remains the argument advanced by some that the destruction of this natural resource by burning is an unconscionable waste that ought not to be permitted and that peat land should remain undeveloped until such future time as we better understand its potential and a practical use for it may evolve (including its value as an energy source as other fossil fuels are depleted).

One further question regarding this current policy has arisen. A decade or so ago there was a developing world wide shortage of food. Prices for grain, and farm land, were very high. Today there is an oversupply of grain and depressed prices (and subsidies in the U.S.A., for example, to take

good farm land out of production). The policy and practice of bringing into production marginal land, that is costly to develop, under current conditions invites question. One can understand the individual farmer's wish to expand his holdings to a more economic size, particularly if he already owns undeveloped peat lands, but the allocation of additional Crown land for immediate development may be ill advised.

The Commission also understands that payments of one form or another have been made by the Government to farmers for the development or improvement of Crown peat land and that this practice evidently still continues in the form of rental subsidies.

Increased Wheat Board quotas obtained by virtue of developing additional crop land and the taxing of unproductive farm land are both practices that also encourage the continued development of marginal land at a time when surplus grain exists and government bonus payments to farmers are necessary to sustain viability in the face of low prices.

3.1.1 RECOMMENDATIONS

3.1.1.1 The Commission believes that, in the light of all the conditions that prevail today, the designation of Crown peat land for immediate agricultural development should be re-examined and re-evaluated to determine if such agricultural utilization is desirable.

3.1.1.2 The Commission recommends that if and when any undeveloped Crown owned peat land is sold or leased for agricultural use, the Department of Agriculture should approve a development plan including specification of the amount of peat, if any, authorized for removal after clearing operations. This plan would be binding on the purchaser or lessee of the Crown Land.

3.1.1.3 The Commission believes that the Manitoba Peatland Farmers Association could provide useful assistance to the Department of Agriculture (perhaps on a contract basis) in the compilation of the recommended land development plans.

3.1.1.4 The Commission further recommends that the Department of Agriculture and/or the Departments of Natural Resources, Economic Development, and Energy and Mines should undertake or continue research into alternative uses for peat land and alternative methods of farming peat soil.

3.2 The Burning of Peat

In the areas of Manitoba where smoke from peat fires has been and continues to be a problem, the primary reason for most of the fires is a desire by farmers to improve peat land that they own or lease for agricultural purposes.

To be developed for farming purposes, the natural peat land must be cleared of shrubs, trees, roots, etc. The practical and economic method for disposing of this material has been burning. This necessity seems to be accepted by everyone. Some drainage construction may also be necessary.

The method of preparing debris from clearing operations for burning is to pile it into windrows to dry. It may be two or more years before the windrow is in a suitable condition to burn.

There are two methods of removing additional unwanted peat, both involving burning:

(a) Burning in situ:

The first, and probably the most common method is to disc the peat soil to a depth of about six inches (15 cm), to facilitate drying of this layer. Under favorable weather conditions, this layer of peat, when dry, can be burned off the field and the moist underlying bed of peat soil will not burn if weather and ground conditions are suitable.

(b) Burning in piles or windrows:

The second method is to scrape a layer of unwanted peat into piles or windrows and to burn these after they have dried to a suitable condition for burning. This drying in piles or windrows is a longer process (2-3 years) but the degree of control of the fire and of smoke generation is likely greater.

3.3 The Best Time To Burn Peat

The prime requisite for a peat fire is that the peat be dry; if it is too wet, it will not burn. Moist peat will take longer to burn and will generate excessive smoke.

The Commission was informed at the hearings that piled or windrowed peat, or peat mixed with land clearing debris, might require a drying period of two years, or more, before becoming suitably dry for good combustion. The Commission was also informed that if the season and weather conditions were optimum, and if the windrowed peat was suitably dry, that a successful burn might be accomplished in two weeks, or less, with a hot fire emitting a minimum of smoke. If atmospheric conditions are favourable, the smoke may

rise and dissipate without much adverse affect on nearby residential areas or highway safety.

Mid-summer conditions with sunshine and light breezes appear to be ideal for burning with a minimum smoke problem (depending to some extent on the total amount of peat to be burned at one time in a given area). Even though weather conditions may not be completely predictable and may not remain stable over a two week period of time, it seems evident that the summer season is the best time to burn if smoke is to be minimized.

In summer, atmospheric temperature inversions, which act to keep smoke at ground level, are less severe and much less likely to occur than in the fall of the year. Also, in the Lac du Bonnet area, for instance, fog frequently occurs during the fall season, accompanying an atmospheric inversion, and the condition of thick peat smoke combined with fog can be a deadly highway hazard. Under such conditions, odor and visibility problems are also created in residential areas. The peat smoke irritates many individuals and particularly affects people with respiratory problems. The unpleasant odor saturates the outdoors and even permeates residences to the extent that the odor lingers in clothing, drapes, and furniture, long after the smoke has disappeared.

Fires burning in the fall, may burn well into the winter, even after snowfall, and continue to pollute the surrounding air.

The Commission visited Lac du Bonnet in December, following the conclusion of the hearings, and drove through the surrounding area to observe conditions and some of the peat fires that were still burning at that time. The Commission learned at the hearings that the windrows which were well organized and properly prepared by experienced and responsible farmers could be burned quickly with a minimum of smoke and that such fires did not continue to burn on into the fall and winter season. The Commission gained the impression that most of the lingering problem fires were ones that were not serving any particularly useful purpose, as opposed to the benefits derived by the well prepared, fast burns. The Commission was surprised to find that nobody was attempting to put out these remaining fires, and that it probably could not be determined who was responsible for starting them, for example, fires burning in the ditch along Highway No. 317.

The Commission came to the conclusion that fires which provide no real benefit, and for which no specific authority or person seems to be accountable, may be responsible for a significant part of the nuisance smoke.

A final question on the burning of peat addressed by the Commission concerns whether or not the practice should be allowed at all, under any circumstances or conditions. A considerable number of people appearing before the Commission felt that the answer to this question should be an unqualified "No".

In considering this matter, the Commission believes that a number of farmers own or have already acquired peat land by lease and have commenced or planned the development of this land as a part of the long term viability of their farm operation. Their investments and plans might be seriously compromised by an immediate and outright ban on the burning of peat.

Further, present government policy, as evidenced by the designation of areas of peat land for agricultural development as "best use" and the continuing practice of leasing and selling sections of this land for this purpose - with the knowledge that the inevitable result of this will be the burning of peat, at least during land clearing, if not beyond this point - clearly promotes and condones the burning of peat.

3.3.1 RECOMMENDATION

3.3.1.1 The Commission recommends that permitted peat fires be restricted to the summer season and be extinguished prior to the onset of fall weather, if smoke problems are to be diminished to a tolerable level. The requirement to extinguish fires before the end of summer, would also provide the opportunity for action to be taken to extinguish any fires still burning before late fall or winter conditions make this difficult or impossible.

3.4 A Permit System For Peat Fires

There is a wide area of provincial government interest and responsibility in the matter of peat fires (and the smoke thereby generated).

A number of departments, as well as municipal government, and crown and private corporations, also have some interest in and/or responsibility for fires (Table 1).

The Department of Natural Resources is apparently the only Provincial Department active in the control of open fires and in the issuance of burning permits but only in the designated "wooded district" and in the designated "closed season". Furthermore, the only real interest of this Department — and the reason for the present permit system — is the protection of Provincial forests from damage by fire. Smoke management or control is not a primary concern.

Smoke from man-made fires is a "contaminant" as defined in the Clean Environment Act and is also listed under the definition of a "waste". Therefore, the Environment Department has an obvious interest and a responsibility for its control.

The Department of Agriculture has a strong interest in the allocation of peat lands for agricultural use and the subsequent development of these lands into farms, including the clearing of peat lands which involves burning.

3.5 Administration of A Permit System

If a permit control system is desirable, what department should logically administer it or should there be a combination of administrative interests?

The problems and concerns about smoke fall within the jurisdiction of the Environment Department, more so than any other. However, there is only one field-based representative of this department (environment officer) in the eastern part of the province where peat burning is prevalent (at Lac du Bonnet). Moreover, the staff of the Environment Department are not likely knowledgeable or experienced in burning management techniques or the control of the peat land fires which produce the smoke.

The Department of Agriculture services the eastern area from a regional office in Beausejour. The basic interest of this department lies in agricultural development and assistance to the farmer in crop production. This staff, also, are likely not experienced in matters of burning and fire control.

TABLE 1

Department/Agency	Interest/Responsibility
Natural Resources	- forest protection - administration of the Fires Prevention Act in designated "wooded districts" - wildlife and habitat management and protection - crown lands management and protection - construction and maintenance of provincial drains
Agriculture	- agricultural development - farm management practices - agricultural designation and utilization of Crown land
Environment & Workplace Safety & Health	- protection of the environment from fire damage and smoke pollution (air quality) - protection of safety and health of farm workers
Health	- protection of public health from possible damage by smoke
Municipal Affairs	- municipal responsibility for fire control.
Labour (Fire Commissioners Office)	- general responsibility for fire prevention and control - administration of the Fires Prevention Act outside of designated "wooded districts," including direction to municipalities re appointment of municipal fire guardians,etc.
Highways & Transportation	- highway safety - maintenance of provincial highway and road allowances - Highway Traffic Act - Manitoba Traffic Safety Committee
Attorney General (R.C.M.P.)	- highway safety and enforcement - Highway Traffic Act
Education	- safety for school buses - education of population re environmental protection
Municipal Governments	- municipal responsibility for fire control - maintenance of municipal road right-of-ways
School Divisions	- operation of schools and school buses
Manitoba Hydro	- right-of-way maintenance
Manitoba Public Insurance Corp.	- Insurance - Highway Traffic Safety Committee
C.N.R. & C.P.R.	- right-of-way maintenance

On the other hand, one of the prime responsibilities of the field staff of the Department of Natural Resources, in the designated "wooded district" which encompasses a large portion of the peatland area of concern, is the control of fire for the purpose of protecting the forest resource. Conservation Officers of the Department are located in Beausejour, Whitemouth, Pine Falls, Seven Sisters, Lac du Bonnet and Hadashville. These officers are well experienced in the management of burning practices in connection with land clearing operations and subsequent burning of peat. This Department is presently responsible for the issuance of burning permits which are necessary in the "wood districts" during the "closed season" from April 1 to November 15th. Conservation officers reside in the district under their control, are generally well known to the local population, and are familiar with the land clearing and farming operations and the burning operations that are carried on.

The present burning permit system administered by this department seems to have worked reasonably well for its intended purpose — to control fire to the extent that the crown forest resource is protected from damage. While there are a number of reported instances each year of fires set without a permit, some of these may not have posed a threat to forests or property. The system has been enforced, however, by frequent charges under the Fire Protection Act including charges for failure to obtain a permit.

The control or elimination of smoke has never been a responsibility under the Fires Prevention Act and for that reason permits have not been issued with this purpose in mind. Also, for this reason, burning permits are not required during the "open" (winter) season when fire control is not a concern with regard to forest protection although smoke from fires is a serious concern for other reasons, particularly in the fall of the year. It would not be logical to expect that anyone but the Department of Natural Resources would be charged with the control necessary for the protection of the forest resource.

At recent public meetings held to explain the implementation and enforcement of the new Environment Act, staff of the Environment Department have stated that Conservation Officers of the Department of Natural Resources will likely be involved in the administration and enforcement of parts of the new Environment Act. The Commission believes that the control of smoke generated by clearing and burning peat land can best be achieved by amending the present permit system under the Fires Prevention Act to take into account smoke concerns and control. This permit should be administered and enforced by the field staff of the Department of Natural Resources. Other forces such as environment officers could also be utilized, if necessary, to assist in enforcement action.

From all points of view, it appears most logical that there should be only one permit system for burning and that this permit should be administered by the field staff of the Department of Natural Resources.

3.6 Existing Fire Controls

The present "wooded district" designated under the Fires Prevention Act includes the peat lands of eastern Manitoba where agricultural clearing and burning practices currently take place. This presently controlled "wooded district", therefore, provides a ready-made and suitable mechanism for the management of fires on peat lands and the smoke that results.

If smoke from peat land fires is to be controlled and reduced to a level acceptable to the residential communities and other concerned citizens in the area, and consistent with maintenance of highway traffic safety, burning should be confined to the summer season.

3.6.1 RECOMMENDATIONS

3.6.1.1 The Commission recommends that the time during which peat fires are permitted should be restricted to a period from June 15 to August 31. During the balance of the presently designated "closed season" (April 1 - November 15) the current permit system would apply for other open fires.

3.6.1.2 The Commission recommends individual on-site inspection of the property of the applicant before a permit is issued to ensure that the windrows or piles of peat are suitably dry, adequately fireguarded, and otherwise ready for burning.

3.6.1.3. The Commission recommends that the practice of burning peat in situ (e.g., see point "a" on page 12) should not be allowed, as adequate control of fire and smoke is not practicable.

Other points which should be considered in developing the permit are the following:

- a limit to the number of and size of piles or windrows.
- a limit to the number of piles or windrows which can be burned within a specified area at the same time.
- predicted weather.
- proximity to highways
- proximity to neighboring residents or communities.
- municipal agreement, where applicable (the municipal fire guardian)
- Agriculture Department (Ag. Rep.) agreement as to agronomic suitability of the contemplated peatland development.
- fire control and burn time plan compiled by the farmer
- fire extinguishing plan compiled by the farmer
- fire control and extinguishing equipment and resources mobilized or available on standby by the farmer.

3.6.1.4 The Commission recommends that a committee be struck to include representatives of the Department of Natural Resources, the Environment Department, the Department of Agriculture, the Department of Municipal Affairs, the Department of Labour (the Fire Commissioner), and a representative of the Manitoba Peatland Farmers Association to decide on details of the new permit requirements. This committee may wish to consult with other peatland farmer representatives.

3.6.1.5 The Commission recommends that it be an offense to create a road hazard through the production of smoke from a peat fire.

The Commission believes that it would be logical that the municipal fire guardians be actively involved in the control or suppression of fires causing a highway hazard or in the initiation of appropriate remedial measures.

3.7 Implementation of A Permit System

The use of the present burning permit system in the designated "wooded district" as the basis for a new permit system would provide the advantage of utilizing a permit and an experienced and qualified enforcement staff that are now known to and accepted by the citizens of the main peat farming areas.

The utilization of the Fires Prevention Act as the legislative authority for the permit also would provide the existing authorization for the enforcement staff to take action when required, including the important right of entry on private property for the purpose of extinguishing a fire and the provision for charging the cost of doing so to the property owner. A schedule of fines for violations is also provided in the Act, although the amount of the fines needs to be re-examined.

At the hearings, municipal and town councils appeared to be supportive of additional regulation and control. It would therefore, seem to be reasonable to suggest that the municipalities in which burning commonly takes place should organize a capability to deal with any peat fires that may be burning after the August 31st deadline, so that all of the responsibility and capability for action does not rest solely with the fire protection staff of the Department of Natural Resources. Municipal fire guardians could organize this fire extinguishing capability, calling on equipment and manpower available within the municipality. New or amended municipal burning by-laws might be required to facilitate this and to make provision for the charge-back of costs to the offending property owner, as considered appropriate by the municipality.

The Commission believes that the Manitoba Peatland Farmers Association might also be useful in the organization of peat fire control and fire extinguishing efforts from within the farming community, if the extinguishing of a peat fire is beyond the capability of an individual farmer.

If farmer or municipal action is taken in a timely manner, provincial enforcement action, with the charge back of costs to an offending peat burner (and fines if warranted), would be necessary only as a last resort.

3.7.1 RECOMMENDATION

3.7.1.1 The Commission recommends that if all peat fires have not burned out or been extinguished by the proposed end of the burning season (August 31) then enforcement action to put out all peat fires should commence.

If prompt action to do so were not taken by the farmer (owner or lessee) on whose land the fire is burning, then the municipality would have to take action to do so — including fires on unoccupied Crown Land; otherwise, the fire fighting forces of the Department of Natural Resources would take action with the charge back of costs to the farmer or municipality as might be

appropriate. It would also be important for the respect of the new system, and for the comfort of citizens, that any peat fires on Provincial or municipal land also be extinguished at the same time, although it is likely more appropriate that action to extinguish fires on such land be taken immediately on detection, while they are still relatively small and easy to put out.

CHAPTER 4

CROP RESIDUE

There seems to be wide agreement by agricultural authorities, including farmers, that incorporation of crop residue into the soil, particularly the straw from the harvesting of cereal grain, to the maximum practical extent, improves the quality of the soil and is in the long term best economic interest of the farmer.

Standing stubble and chopped straw also help to reduce soil erosion by wind and water. Over a period of years the continual incorporation of straw into the soil will help to maintain, to a significant degree, the organic matter content in the soil. The tilth and water retention qualities of the soil are also improved and there is a long term increase in available nitrogen, which can ultimately reduce the requirement for commercial fertilizer application. **Notwithstanding these benefits, the agricultural authorities and the great majority of farmers making presentations to the Commission contended that the burning of some selected farm residue is sometimes necessary.**

4.1 The Manitoba Department of Agriculture Position

Dale Partridge, Chief of Land Utilization and Soil Survey in his presentation on behalf of the Manitoba Department of Agriculture stressed the negative effects of burning crop residues and the long and short term benefits that are achieved by the incorporation of residues into the soil. These benefits include reduced water and wind erosion of soil. It was estimated that 60 per cent of crop residues may be lost by the burning of windrowed straw. This presentation also outlined a number of situations where burning is done inappropriately and with little or no beneficial effect.

Mr. Partridge listed the following circumstances when the managed burning of crop residue may be an acceptable agricultural practice:

1. Managed burning of windrows of debris from land clearing operations.

2. Managed burning of heavy flax straw in bunches when it is unable to be sold for fibre processing.

3. Managed windrow burning of cereal crop residues on late, wet falls when straw production is extremely heavy.

4. Managed burning of crops still unharvested at seeding time, as a consequence of wetness, disease, etc.

5. Managed burning of residues accumulated in fence rows, drains, etc. as a consequence of wind or water action.

6. Managed burning of road ditches inaccessible for mowing to help prevent blocking of roads by snow.

7. Periodic managed burning in native pasture management to maintain proper balance between desirable and undesirable grasses and forbs (non-grass-like plants).

8. Periodic managed burning on lowland meadows used for hay or grazing to remove dead grasses and sedges accumulated during wet years when such lands cannot be hayed or grazed.

9. Managed burning to control insect problems in forage seed production, such as plant bugs in alfalfa (early spring).

10. Managed burning to control some diseases of perennial crops, such as leaf spot and blackstem in alfalfa.

11. Managed burning in forage seed production to obtain a good seed set, such as Kentucky Bluegrass seed production (post-harvest or early spring).

12. Periodic managed burning in blueberry production for disease control and promoting new growth.

In the foregoing items, "managed burning" was stated to mean burning at times and under conditions when smoke would adequately disperse so as not to create dangers and undue discomfort to people and property.

Mr. Partridge advised that in 1988, the Department of Agriculture has planned field demonstrations pertaining to residue management in the districts of Starbuck and Morris both of which have high incidences of burning.

Mr. Partridge submitted estimates of straw and stubble burning compiled by agricultural representatives in all agricultural regions of the province during the fall of 1987. Similar estimates were documented at the time of the last Commission hearings on smoke in 1976. For some localities, estimates of burning that occurred in 1984 were also given. Data showing the percentage of farm fields burned in the past several years was also detailed, including the percentage of windrow burning only, as opposed to total straw burning and the percentage of cereal and flax straw burned.

There was a well defined and significant reduction in total burning practice since the 1976 hearings in almost every reported location. During the hearings, many others observed that there was a definite downward trend in the incidence of burning. This was assumed to be the result of generally increasing acceptance of the determination that the burning of straw is an economic disadvantage to the farmer and that the long term degradation of the soil as a result of continuous burning is a very serious and perhaps irreversible consequence of such a practice.

The University of Manitoba Position

A very high percentage of the reported burning was done in windrows. The percentage of cereal crop straw burned was quite low in most areas (many areas reported only 10%); however, a high percentage of flax straw was reported burned (75% in most areas). Although the incidence of burning in the areas west and south of Winnipeg is being reduced, there continues to be a very high percentage of burning in these areas.

4.2 The University of Manitoba Position

Dr. Geza Racz, Head of the Department of Soil Science at the University of Manitoba, in his statement to the Commission, emphasized his basic concern for soil quality and the very significant reduction in organic matter content of farm soil that will occur over the long term if annual crop residue burning is practiced rather than incorporation back into the soil. In the long term, this reduction will affect the fertility of the land and the livelihood of future generations of farmers. Dr. Racz and his colleagues have been studying the decline of organic matter in farm soil and have estimated that at equilibrium (estimated 75 years), a soil with a present organic matter content of 5.3 per cent would have the organic matter content reduced to 2.3 per cent if continual burning of only windrows of crop residue were to be practised (estimated 60 per cent residue burned) as opposed to 4 per cent if the residue was retained in the soil. Burning is thus responsible for a dramatic degradation in soil quality. Dr. Racz also endorsed the recommendations made by Mr. Partridge.

4.3 The Keystone Agricultural Producers' Position

The Keystone Agricultural Producers supported the position that the burning of crop residue is not, in the long term, good farm management practice. **Although there has been good progress in this area, there continues to be more burning of crop residues than is either desirable or necessary**. This brief also outlined a number of conditions and circumstances under which they considered that "controlled" burning is a legitimate and necessary practice. It was recommended that The Manitoba Department of Agriculture should administer the management of agricultural burning, including the development of comprehensive guidelines for burning. The Department should emphasize educational thrusts regarding the long term effects of sustained burning. Further research should be undertaken regarding economical alternatives to burning, straw incorporation techniques, better and cheaper straw incorporation equipment, etc. Departmental educational programs should assist farmers to be knowledgeable about the most efficient and safest methods of burning, when this is necessary, including the use of weather information to determine the best time to burn. In summary, they advocated education rather than stringent restrictions on burning as the means to achieve control and reduction of the burning of crop residue.

4.4 Flax Straw

Farmers and agricultural experts agreed that the disposal of flax straw by incorporation into the soil was difficult at best and practically impossible under most conditions. Some flax straw is baled and processed for purposes of paper manufacture but this is a limited market and the flax straw may be rejected because of weed infestation. Even when this straw is processed for paper, a significant residue must still be burned on the processing site.

Flax straw is generally windrowed or piled for burning. Burning is frequently done during the daytime hours since flax stubble will not ignite readily. Burning in piles favors a hot burn with lower production of smoke. As well, atmospheric thermal inversion conditions are less likely during the daytime hours. Daytime conditions, especially on hot, sunny days, generally improve smoke dispersion and reduce the problem caused by smoke.

4.4.1 RECOMMENDATION

4.4.1.1 The Commission recommends that the burning of flax straw, when necessary, be conducted during the daytime when conditions are favourable.

4.5 Other Non-Cereal Crops

Agricultural authorities, including farmers, also agreed that the residue from forage crops, especially forage seed crops and other specialty crops, required burning for reasons of disease and insect control and to manage and promote the good growth of new crops. Burning is also an accepted pasture management technique. On lowland meadows used for hay or grazing, burning is periodically employed to remove dead grass and improve the quality and production of new growth. In these cases, however, it should also be possible to conduct burning operations under conditions where a rapid burn can be achieved with good smoke dispersion without creating a problem for others. The acreage under production of these crops is relatively small compared to the production of flax and cereal grains.

4.5.1 RECOMMENDATION

4.5.1.1 The Commission recommends that burning of non-cereal crop residues be conducted under conditions such that a rapid burn can be achieved without creating a smoke problem to others.

4.6 Other Considerations

Many reasons were given by farmers for the burning of crop residue, including weather, and crop and field conditions which make it necessary — or at least economically and practically desirable on occasion — to burn some straw. When burning is considered necessary, almost all farmers now burn only windrowed straw, as total field burning is undesirable and unnecessary. This may occur primarily when windrowed straw fires become out of control.

The trend to larger farms that has occurred in recent years may encourage burning of crop residues. Large equipment must be utilized to manage large farms efficiently and economically. The Commission was told that **wide swathers make the chopping and distribution of straw from a heavy cereal crop difficult during combining operations** thus discouraging the incorporation of straw into the soil.

Under today's depressed farm economic conditions, the purchase of new equipment including suitable chopping and distributing equipment may well be impossible for many farmers who are struggling for economic survival. Many farmers also spoke of the added cost of operating straw chopping and distributing equipment and the added cost of tilling or harrowing to incorporate the straw into the soil in the preparation of a proper seed bed. Heavy straw in good crop years aggravates these problems. The fear of unfavourable weather conditions hindering or preventing the incorporation of straw into the soil, with the subsequent inability to prepare a good seed bed, may lead many farmers to a decision to burn straw.

Almost all farmers stressed their view that only they can be the proper judge of when and how much burning is necessary depending on crop, soil, weather and many other local conditions, including economic factors.

4.7 Alternatives To Burning Straw

In addition to the generally accepted agronomic benefit of incorporation of crop residue into the soil, other possibilities for use of the straw were presented to the hearing.

A spokesperson for the Biomass Energy Institute Inc. outlined a number of other possible uses for straw. The chief of these was the possible use of baled straw for the generation of heat for homes, industries or other purposes such as the drying of grain. In fact, some straw has been used by Genstar Corporation for heat generation in their cement manufacturing operation. Other possibilities for uses of this organic material are for the production of alcohol and use as an animal feed, after enhancement by special treatment. However, while all of these uses are possible, the economic practicability of utilization of straw for such purposes is extremely limited.

4.8 The Burning Of Cereal Grain Straw

The burning of windrowed cereal grain straw accounts for most of the crop residue burning that occurs and probably generates most of the smoke related concerns. There are conditions under which the burning of straw may be necessary, such as, straw blown or washed into land depressions or ditches, but these occurrences will account for only a small portion of the straw burning that takes place.

How and under what conditions should windrowed straw be burned?

The best time to burn, to create a hot fire and a rapid burn with the creation of the least possible smoke and good dispersion, is on a hot day when the straw is very dry and atmospheric conditions are such that rapid dispersion of smoke will take place into the upper atmosphere. Unfortunately, under such conditions, there is a high risk of fire spreading from the windrows to burn the entire field with the creation of even more smoke and with the possibility of damage to adjacent properties. Under such a situation the farmer also loses all his straw with the previously discussed undesirable effects to his own farm operation.

For the foregoing reason, many farmers choose to burn their windrows at night when the temperature is cooler and the humidity is higher. Relatively calm wind conditions, which also frequently occur at night, will also increase the ability to control the fire. Unfortunately, under such conditions the burning will create much more smoke and, as well, calm winds — or even more importantly — atmospheric temperature inversions, which occur with frequency in the fall season, may keep the smoke at ground level without good dispersion and allow it to drift into nearby communities. The creation of a highway hazard is also more likely under such nighttime conditions.

It was the claim of some farmers that they managed their burning practice to the extent that any burn did not last more than two or three hours and that they were able to choose conditions for burning such that the smoke generated would not cause any problems or concern. **Frequency of windrow lighting, choice of burning time, and attention to weather conditions and weather forecasts were cited as important factors in their success.** It must be recognized that late harvest, unfavourable and unpredictable weather and other factors may complicate such considerations and planning.

The Commission was interested to note that, in most areas where hearings were held, there were many farmers who stated that they carried out no burning and had not done so for many years. Some of these farmers condemned the practice of burning as being totally unnecessary and unwarranted under almost any circumstance. Some of these farmers operated large farms under apparently no different conditions from those of neighboring farmers, who did some burning. **Many farmers felt strongly that burning is being carried out to a much larger extent than is necessary.**

The Commission was unable to determine to its satisfaction whether or not soil type was a significant factor in the success of incorporating straw into the soil. Lighter soil facilitates incorporation and decomposition of straw and heavier soil tends to produce more straw in the first place. The practice of neighboring farmers was not consistent — some did not burn, while others did; however, it is important to remember that soil type can vary from farm to farm.

As a result of Mr. Partridge's survey it is evident that the municipalities to the west and south west of the City of Winnipeg are among those where the incidence of straw burning is the highest in the Province. This has resulted in the aggravation, discomfort, and complaints, from citizens of the City, which have annually been made to the Environment Department when conditions are such that a large quantity of smoke from straw burning has impinged on the City.

During the course of its hearings the Commission received only one or two complaints or statements of concern about stubble burning from farmers or citizens of rural communities. Some farmers related discomfort by family members or neighbors having respiratory illnesses, such as asthma; but these farm oriented people were willing to accept temporary, short term discomfort as a necessary fact of rural life. Municipal officials reported no complaints from any of their constituents.

The Commission finds it difficult to understand that, in view of Winnipegers' concerns, other residents of communities surrounding Winnipeg (so called bedroom communities) which are the home of numbers of transplanted Winnipeg people who work in and commute to Winnipeg, were not bothered enough to speak out, with the exception of one or two people. It is possible that people in rural communities did not choose to confront their neighbors with their complaints. One rural council of a southern Manitoba municipality did register some concern about smoke affecting highway traffic.

4.9 Control Of Burning

If regulated controls should be placed on the burning of crop residue what form should they take and how should they be administered?

Municipal governments have the power to control burning within their jurisdictions. They can pass burning by-laws and in additions have the obligation under the Fires Prevention Act to control wild fire within their jurisdiction, appoint fire guardians, etc. At the Commission's 1976 hearings on smoke, the President of the Union of Manitoba Municipalities stated emphatically that any control of farm fires must remain within the municipal jurisdiction. During the current hearings; however, **almost all municipal reeves and councillors were adamant that if a permit system of control for crop residue burning were to be instituted, it should not be given to the municipal government for administration or enforcement.**

The consistent plea of municipal officials and almost all of the farmers, who spoke or made submissions to the Commission during the course of the hearings, was that any form of permit control on crop residue burning, not only was not required but also would impose a severe inconvenience and unnecessary hardship on already hard pressed farm operations. Farmers stressed the point that the farm harvest season is an extremely busy one and that flexibility is necessary for the farmer, in his judgement, to determine how and when he might find it necessary to burn. Any pre-planning in this regard could be invalidated by an unforecasted change in the weather or other unforeseen conditions.

On the other hand, those who opposed burning generally advocated that the practice should either be completely banned or else rigidly controlled by a provincially administered permit system; it was felt by these people that municipal administration and enforcement would not be satisfactory.

4.9.1 RECOMMENDATION

4.9.1.1 The Commission recommends against legislated regulation of the burning of crop residues. It believes that a permit system is not a practicable solution to the current smoke problem.

4.9.1.2 The Commission recommends that it be an offense to create a road hazard through the production of smoke from the burning of crop residue.

The Commission believes that it would be logical that municipal fire guardians be actively involved in the control or suppression of fires causing a highway hazard or in the initiation of appropriate remedial measures.

4.9.1.3 The Commission recommends that extension work and education on crop residue management be intensified and extended.

The Commission believes the Manitoba Department of Agriculture and the Faculty of Agriculture of the University of Manitoba are keys to the success of this recommendation. The field demonstrations of crop residue management planned by the Department of Agriculture in the Rural Municipalities of Macdonald and Morris this year should be very useful in this regard.

4.9.1.4 The Commission recommends that farming community leaders be involved in the education process.

4.9.1.5 The Commission recommends that the Manitoba Department of Agriculture develop a "code of good burning practice" to encourage problem-free burning when the burning of crop residue must occur.

4.9.1.6 The Commission recommends that the farming communities make full use of the Weather Radio forecast information provided by the Atmospheric Environment Service of Environment Canada, including wind direction in relation to nearby communities.

4.9.1.7 The Commission recommends that a review of the crop residue burning situation be conducted in five years time, including a re-examination of the necessity for legislated regulatory control.

CHAPTER 5

HEALTH ASPECTS OF SMOKE FROM BURNING OF PEAT AND CROP RESIDUES

5.1 Introduction

During the 1976 "Smoke Investigation" undertaken by the Clean Environment Commission, considerable concern was expressed by citizens about the possible effect on public health of smoke resulting from agricultural burning practices. The Commission reported, however, that medical evidence submitted at the hearings indicated no health problems associated with the general exposure to smoke. There were reports of some medical problems experienced by people living in locations subject to a severe concentration of smoke from peatland burning. Medical evidence indicated that people suffering from chronic pulmonary ailments or allergies had aggravated symptoms after exposure to smoke.

At the current set of hearings, expert medical testimony related to public health was received from a lung specialist from the St. Boniface Hospital, a lung specialist from the Faculty of Medicine of the University of Manitoba, and the Provincial Epidemiologist of the Manitoba Department of Health. In addition, a family medical practitioner in each of Lac du Bonnet and Pine Falls was contacted and asked to reflect on the problems of smoke and any increased incidence of medical consultation or hospital admissions by patients with respiratory problems during times when smoke conditions prevailed.

The presentation of the Manitoba Environmental Council addressed health related effects of smoke. There were also many citizen presentations, both in connection with the burning of crop residue and peat land burning, that expressed concerns about smoke problems experienced and their relationship to health. Many of these citizens or members of their families had respiratory problems or allergies and believed that their condition was substantially worsened during smoke episodes. Other citizens, who were not subject to respiratory problems or allergies, felt that the smoke interfered unduly with their comfort, well being, or enjoyment, and expressed varying degrees of outrage and concern that they should be subjected to the conditions and effects caused by smoke from agricultural burning practices.

5.2 Medical Positions

The Commission was grateful that the Head of Respiratory Medicine from the St. Boniface Hospital, on short notice, agreed to accept the Commission's request to participate in the hearings. Because his appearance had not been planned in advance it was presented without the benefit of documented scientific, clinical data, analyzed to present a statistically documented evaluation of any increase in the number of hospital admissions or patient calls to the chest clinic during times when smoke was prevalent. However, it was this doctor's impression from his personal anecdotal clinical experience that patients who have underlying lung disease of almost any type, will be

aggravated by the additional pollution in the air that is encountered in the fall of every year. The doctor stated that this might be caused by an allergy to pollens or similar allegens that become air-borne at this time of year but that it was his impression that the aggravated condition of patients was related to the burning of peat or stubble.

Patients with severe lung disease, such as advanced emphysema, and those with heart disease secondary to their lung disease, may be severely affected and require hospital admission. He was not prepared to state what the impacts of stubble smoke was on individuals with normal health. The doctor also stated that he did not think that any breathing disorders were actually caused by smoke from the burning of stubble but that a large number of breathing disorders could be aggravated by smoke.

It was this doctor's opinion that a proper epidemiological study over a period of several years — including several hospitals in the rural areas as well as the city — would be necessary to arrive at a scientificially valid conclusion about the health effects of smoke from agricultural burning. This would be a large and costly research undertaking.

The lung specialist from the University of Manitoba had a somewhat different opinion. This medical doctor had made a presentation at the Commission's hearings on smoke in 1976, on which occasion he gave evidence on behalf of the Manitoba Environmental Council. He stated that his personal interest was in environmental as well as occupational lung disease, particularly occupational lung disease of farmers. He is also the Chairperson of the Manitoba Lung Association's committee on environmental issues. This committee included a respiratory nurse, a scientist from the University of Manitoba involved in pollution, and a specialist in allergic and asthmatic diseases of children. The doctor was partially representing this committee as well as himself.

He stated that while, in his experience, there are a number of people with lung disease who strongly believe that their condition is made worse by exposure to stubble smoke, there are likely an equal number of his patients, whose lungs are a bit worse than usual, who feel that smoke has nothing to do with their condition. As well, the majority of patients seen in the fall of the year offer no comment.

This doctor's opinion was that people with normal lungs are not adversely affected by smoke from stubble burning. After reviewing the submission from the Environment Department on the analysis resulting from the monitoring of smoke, it was the his view that this smoke does not contain the substances which are traditionally associated with air pollution episodes and associated lung disease, for example sulphur dioxide, oxides of nitrogen, and ozone. In this regard, however, the doctor's environmental committee feels that there is virtually no available data on smoke from burning organic material, such as stubble. A basic environmental scientist might be interested in looking at the possibility of there being more complex chemicals in the air from the burning stubble — even the possibility of pesticide

residues in the smoke. The doctor had difficulty in thinking that this would likely be of significant importance but acknowledged that the possibility exists.

The doctor's view was that there is a common assumption of a flare-up of lung problems in the fall attributable to stubble smoke; however, he believed that this assumption was simplistic and that aggravation of lung problems in the fall is a very complex matter. This phenomenon occurs right across the country and not just in Winnipeg, where stubble smoke may occur. In the fall of the year there is frequently an epidemic of virus infections which are a major cause of the worsening of asthma or emphysema, for example, in people with lung disease. Harvest time also stirs up large amounts and a great variety of vegetable material, rotting leaves, molds and fungal spores that are released into the atmosphere. Spores from molds and fungi in particular are well known causes of the exacerbation of asthma. It was the doctor's opinion that if lung disease is worse and if there happens to be smoke in the air, the smoke will likely be blamed.

In summary this doctor believed that stubble smoke is an irritant which could make people with asthma or emphysema worse, but that, to his knowledge, there is nothing which exists in the smoke that is clearly associated with the exacerbation of lung disease. In addition, it would be extremely difficult to confirm that stubble smoke is causing a health problem in the community as a whole.

Neither of the family medical practitioners contacted in Pine Falls and Lac du Bonnet had clinical medical evidence that asthma and chronic chest problems were exacerbated on smoky days.

5.3 The Manitoba Department of Health Position

The Provincial Epidemiologist of the Manitoba Department of Health had conducted a study of the number of visits to two hospital emergency departments within the City of Winnipeg on smokey days, compared to non-smokey days, during the fall of 1986. The survey showed no increase in the total number of hospital visits for any cause and no increase in the number of visits from asthmatics on smokey days. On one of the smokey days, in late September (at a time when the Environmental Management Division received a significant number of complaints concerning smoke), the physicians conducting the survey also telephoned all of the hospital emergency departments in Winnipeg, as well as the Respiratory Centre Clinic and the Victorian Order of Nurses, who have a responsibility for supplying home oxygen to persons with chronic lung disease. In all of these contacts, there was no increase in problems reported. The study concluded that there were no major health risks for the population from the smoke from crop residue. There is a possibility of aggravation of asthmatic symptoms. Such symptoms would not, however, be identified by the study conducted.

5.4 The Manitoba Environmental Council Position

The Manitoba Environmental Council contended that the earlier investigation on smoke problems omitted consideration of the deleterious impacts of crop residue burning on individuals suffering from respiratory ailments, which number may be as many as 18,000 to 30,000 in the City of Winnipeg (up to 5 per cent of the population). Many of these individuals with lung and bronchial disorders are vulnerable to aggravation by smoke. Respiratory attacks may be triggered by smoke which may be present for only a short period of time but the ailment may persist for protracted periods. Thus in the view of the Council it is unconscionable that a relatively few farmers should put in jeopardy the health of so many people. In the absence of good clinical evidence, the Council recommended that an epidemiological study be initiated to determine the relationship between the incidence of abnormal respiratory symptoms in the fall season and the burning of crop residue.

5.4.1 RECOMMENDATIONS

5.4.1.1 The Commission recommends that the advisability of an epidemiological study to evaluate the human health implications of exposure to smoke from the burning of peat and crop residues be given consideration by the Manitoba Department of Health.

5.4.1.2 The Commission recommends that samples of smoke from the burning of peat and crop residues be analyzed by the Environment Department for compounds which may be responsible for deleterious effects on human health and that the analytical results be given to the Manitoba Department of Health.

CHAPTER 6

LIST OF RECOMMENDATIONS

Section 3.1.1 Page 11

3.1.1.1 The Commission believes that, in the light of all the conditions that prevail today, the designation of Crown peat land for immediate agricultural development should be re-examined and re-evaluated to determine if such agricultural utilization is desirable.

3.1.1.2 The Commission recommends that if and when any undeveloped Crown owned peat land is sold or leased for agricultural use, the Department of Agriculture should approve a development plan including specification of the amount of peat, if any, authorized for removal after clearing operations. This plan would be binding on the purchaser or lessee of the Crown Land.

3.1.1.3 The Commission believes that the Manitoba Peatland Farmers Association could provide useful assistance to the Department of Agriculture (perhaps on a contract basis) in the compilation of the recommended land development plans.

3.1.1.4 The Commission further recommends that the Department of Agriculture and/or the Departments of Natural Resources, Economic Development, and Energy and Mines should undertake or continue research into alternative uses for peat land and alternative methods of farming peat soil.

Section 3.3.1 Page 14

3.3.1.1 The Commission recommends that permitted peat fires be restricted to the summer season and be extinguished prior to the onset of fall weather, if smoke problems are to be diminished to a tolerable level. The requirement to extinguish fires before the end of summer, would also provide the opportunity for action to be taken to extinguish any fires still burning before late fall or winter conditions make this difficult or impossible.

Section 3.6.1 — Page 18, 19

3.6.1.1 The Commission recommends that the time during which peat fires are permitted should be restricted to a period from June 15 to August 31. During the balance of the presently designated "closed season" (April 1 - November 15) the current permit system would apply for other open fires.

3.6.1.2 The Commission recommends individual on-site inspection of the property of the applicant before a permit is issued to ensure that the windrows or piles of peat are suitably dry, adequately fireguarded, and otherwise ready for burning.

3.6.1.3. The Commission recommends that the practice of burning peat in situ (e.g., see point "a" on page 12) should not be allowed, as adequate control of fire and smoke is not practicable.

3.6.1.4 The Commission recommends that a committee be struck to include representatives of the Department of Natural Resources, the Environment Department, the Department of Agriculture, the Department of Municipal Affairs, the Department of Labour (the Fire Commissioner), and a representative of the Manitoba Peatland Farmers Association to decide on details of the new permit requirements. This committee may wish to consult with other peatland farmer representatives.

3.6.1.5 The Commission recommends that it be an offense to create a road hazard through the production of smoke from a peat fire.

Section 3.7.1 — Page 20

3.7.1.1 The Commission recommends that if all peat fires have not burned out or been extinguished by the proposed end of the burning season (August 31) then enforcement action to put out all peat fires should commence.

Section 4.4.1 — Page 25

4.4.1.1 The Commission recommends that the burning of flax straw, when necessary, be conducted during the daytime when conditions are favourable.

Section 4.5.1 Page 26

4.5.1.1 The Commission recommends that burning of non-cereal crop residues be conducted under conditions such that a rapid burn can be achieved without creating a smoke problem to others.

Section 4.9.1 Page 30, 31

4.9.1.1 The Commission recommends against legislated regulation of the burning of crop residues. It believes that a permit system is not a practicable solution to the current smoke problem.

4.9.1.2 The Commission recommends that it be an offense to create a road hazard through the production of smoke from the burning of crop residue.

4.9.1.3 The Commission recommends that extension work and education on crop residue management be intensified and extended.

4.9.1.4 The Commission recommends that farming community leaders be involved in the education process.

4.9.1.5 The Commission recommends that the Manitoba Department of Agriculture develop a "code of good burning practice" to encourage problem-free burning when the burning of crop residue must occur.

4.9.1.6 The Commission recommends that the farming communities make full use of the Weather Radio forecast information provided by the Atmospheric Environment Service of Environment Canada, including wind direction in relation to nearby communities.

4.9.1.7 The Commission recommends that a review of the crop residue burning situation be conducted in five years time, including a re-examination for the necessity of legislated regulatory control.

Section 5.4.1

5.4.1.1 The Commission recommends that the advisability of an epidemiological study to evaluate the human health implications of exposure to smoke from the burning of peat and crop residues be given consideration by the Manitoba Department of Health.

5.4.1.2 The Commission recommends that samples of smoke from the burning of peat and crop residues be analyzed by the Environment Department for compounds which may be responsible for deleterious effects on human health and that the analytical results be given to the Manitoba Department of Health.

APPENDIX A

LIST OF EXHIBITS FROM HEARINGS

Grosse Isle, October, 1987

1. Mr. J.D.L. Partridge, Chief, Land Utilization & Soil Survey, Manitoba Agriculture, Brief, Manitoba Department of Agriculture Submission To Clean Environment Commission on Burning of Crop Residue, dated October 20, 1987.

2. Ms. S. Miller, Miller Brothers, Brief, Burning of Crop Residue, dated October 20, 1987.

3. Mr. William Toews, Brief, Stubble Burning, dated October 20, 1987.

4. Reeve Allan Beachell, President, Union of Manitoba Municipalities and Reeve of the Rural Municipality of Rosser, Brief, The Public Hearing on Stubble Burning, dated October 20, 1987.

5. Environmental Control Services, A Review of Information of Stubble Burning in Manitoba, October 19, 1987.

Oak Bluff, October 23, 1987

1. Mr. Jack Oatway, Rosser, Manitoba, Brief, Urban Centre Stubble Burning, dated October 23, 1987

2. Mrs. Audry Turbutt, President, Manitoba Women's Institute, Brief, Stubble Burning, dated October 23, 1987.

3. Mr. Barrie Atkinson, Environment Canada, Atmospheric Environment Service, Brief, Farm Burning Practices, dated October 23, 1987.

3.A. Atmospheric Environment Service, Pamphlet, "Making the Most of Environment Canada's Weather Forecast", revised 1983.

3.B. Atmospheric Environment Service, Pamphlet, "Your Guide to Weather Services in the Central Region"

Oak Bluff, October 23, 1987

3.C. Atmospheric Environment Service, Pamphlet, "Weather Radio Canada", (English).

3.D. Atmospheric Environment Service, Pamphlet, "Weather Radio Canada", (French).

4. Mr. Garvin Kabernick, Brief, Farm Burning Practices, dated October 23, 1987.

5. Mr. Gary Karlowski, Brunkild Pool Elevator Association, Brief, Farm Burning Practices, dated October 23, 1987.

6. Reeve Laverne Mannes, R.M. of Macdonald, Brief, Farm Burning Practices, dated October 23, 1987.

Niverville, October 26, 1987

1. Claude O. Vermette, Brief, Farm Burning Practices, dated October 26, 1987.

2. Mr. Jules Turenne, Piney, Manitoba, Brief, Burning of Straw and Crop Residue.

Brandon, October 27, 1987

1. Reeve J. R. Guthrie, R.M. of Pipestone, Brief, Agricultural Burning Practices.

2. Reeve John Moore, R.M. of South Cypress, Brief, Agricultural Burning Practices, dated October 27, 1987.

3. Stan Good, Boissevain, Manitoba, Brief, Burning - A Summary, dated October 26, 1987.

4. Garth Butcher, Manitoba/North Dakota Zero Tillage Farmers Association, Brief, Stubble Burning Hearing, dated October 27, 1987.

LIST OF EXHIBITS (continued)

Dugald, October 30, 1987

1. Manitoba Agriculture, Map, Agriculture Regional Boundaries, dated, October 30, 1987.

2. Stephen Chuckry, Committee for Burning of Peatland, Brief, Resolution: RE: Peat Burning, dated November 22, 1984.

3. Aileen Krausher, President, Dugald Women's Institute, Brief, Hearings RE: Stubble Burning, dated October 30, 1987.

4. Manitoba Environmental Council, Brief, Environmental Impacts of Stubble Burning, dated October 6, 1987. (This brief repeated at many of the hearings).

November 2 - 3, 1987

1. Dr. Beth Candlish, Biomass Energy Institute Brief, Strawburning, dated November 1, 1987.

1.A. Biomass Energy Institute Magazines - Bio Joule with articles on the utilization of crop residue

Volume 9, Issue 2, December, 1986
Volume 9, Issue 3, January, 1987
Volume 9, Issue 6, July, 1987
Volume 10, Issue 2, November, 1987

2. Mrs. D. Doersam, Brief, "Burning (Agriculture)", dated November 2, 1987.

3. Reeve David Gislason, Rural Municipality of Bifrost, Brief, Agricultural Burning Practices, dated November 2, 1987.

4. Mr. Eric Fridfisson, President, Manitoba Forage Seed Producers Association, Literature References - on Loan.

5. Mr. Terry Rempel, Manitoba Institute of Agrologists, Brief, Burning of Crop Residue, dated October 30, 1987.

6. Mr. Lawrie Bowles, Wildlife Branch, Department of Natural Resources, Brief, Stubble Burning & Related Wildlife Concerns, dated November 2, 1987.

November 2 - 3, 1987

7. State of Minnesota, Pollution Control Agency, Brief, Open Burning Restrictions and Permitting Requirements, dated October 20, 1987.

7.A. Anita M. Twaroski, Regulatory Compliance Section, Minnesota Pollution Control Agency to Mrs. Kim Benson, Soil and Water Conservation, Minnesota, Department of Agriculture, Letter, dated September 10, 1987.

8. Environmental Control Services, Annual Summary of Air Quality Data, 1983 to 1986 for locations in Winnipeg.

9. City of Edmonton, By-Law No. 7395 - "To Regulate the Jurisdiction and Functions of the City of Edmonton Fire Department and its Officials and to Regulate Those Matters Pertaining to the Protection of Life and Property From Fire, dated October 9, 1984.

10. Douglas W. Westzstein, Office of Air Quality and Solid Waste, Pierre, South Dakota, Department of Water and Natural Resources, Letter, dated October 8, 1987.

10.A. South Dakota Regulations, Article 74:26 "Air Pollution Control Program, 114 pages, dated May 21, 1986.

11. Mr. Don Regehr, Manitoba Environment, Workplace Safety and Health, Air Standards and Studies, Report No. 85-10, Manitoba Ambient Air Quality Annual Report, 1984.

12. Dr. Ian Johnson, Manitoba Department of Health,

Carman, November 4, 1987

1. Reeve William K. Roth, Rural Municipality of Dufferin, Brief, Agricultural Burning Practices, dated November 4, 1987.

2. Reeve Jacob H. Schroeder, Rural Municipality of Rhineland, Brief, Agricultural Burning Practices, dated November 4, 1987.

3. Reeve Albert St. Hilaire, Rural Municipality of Montcalm, Brief, Agricultural Burning Practices, dated November 4, 1987.

LIST OF EXHIBITS (continued)

Elie, November 5, 1987

1. Patricia Thomaschewski, Councillor, Rural Municipality of Cartier, Brief, Stubble Burning Presentation, dated November 5, 1987.

2. Mr. Carl Dyck, Representation, Aerial Photos.

3.A. Winnipeg Sub/Division, Headingly Detachment, Royal Canadian Mounted Police, Press Release, Traffic Accident - January 28, 1985.

3.B. Manitoba Highways and Transportation, Driver and Vehicle Licencing, Report of Motor Vehicle Accident Forms, dated September 2, 1987.

4. J. Knight, Reeve, Rural Municipality of Portage la Prairie, Brief, Agricultural Burning Practices, dated November 5, 1987.

Whitemouth, November 30, 1987

1. Paul R. McIntosh, Manitoba Peatland Farming Association, Brief Use of Burning In Agriculture, prepared by the Board of Directors, dated November 30, 1987.

2. Mrs. Dorothy Flanagau, Great Falls Women's Institute, Brief Agricultural Burning Practices, dated December 2, 1987.

3. Mr. A. Briggs, Department of Natural Resources, Brief RE: Peat Fires, dated November 30 and December 2, 1987.

Lac du Bonnet, December 2, 1987

1. Village of Lac Du Bonnet, Brief, Guidelines To Deal With Peat Fires In Eastern And Southeastern Manitoba, Winter 1984/85, dated November 14, 1984.

2. Rural Municipality of Lac Du Bonnet, Brief, Burning of Peat and Crop Residue, dated December 2, 1987.

Lac du Bonnet, December 2, 1987

3. R. Bouvier, Resident Administrator, L.G.D. of Alexander, Brief, Hearings on Farm Burning Practices in Manitoba, dated December 2, 1987.

4. Mr. Mel Schwark, Mr. A. Richard Rattai and Mr. Ed Gusta, Brief, Farmers Brief on Burning as a Land Clearing and Management Tool, dated December 7, 1984.

5. Mrs. Dess Trudell, citizen of Pine Falls, Brief, Agricultural Burning Practices in Manitoba, dated December 2, 1987.

6. Mr. Rod Beaudry, "I am speaking for 1200 petitioners", Brief, Opposed to the Present Practice of Burning Peat Moss in the Eastern Region of Manitoba, dated December 2, 1987.

7. Mr. Don Dixon, Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment, Brief, Investigating Farm Burning Practices, dated December 2, 1987.

7.A. Mr. M. G. Wright, General Manager, Atomic Energy of Canada Limited, Whiteshell Nuclear Research Establishment, Letter, The Impact of Peat/Stubble Fires on the Atmosphere, dated November 23, 1987.

8. Fran Thompson, citizen of St. Georges, Brief, Agricultural Burning Practices, dated December 2, 1987.

9. Mr. Dave Fisher, Chairman, Agassiz School Division, Brief, "Hearing on Farm Burning Practices in Manitoba", dated December 2, 1987.

10. Paul McIntosh, citizen of Lac Du Bonnet, Submission, Agricultural Burning Practices, dated December 2, 1987.

11. Mr. R. D. Chown, Woods Manager, Abitibi-Price Inc., Submission, Farmland Burning Inquiry, dated December 1, 1987.

12. Ms. Marjorie Thompson, Winnipeg River Women's Institute, Brief, Resolution RE: Peat Moss Burning, dated December 2, 1987.

13. Cpl. L. Barr, Royal Canadian Mounted Police, including a report by, Mr. W.D. Hume, Chief, Scientific Services Division, Atmospheric Environment Service, Environment Canada, RE: Poor Visibilities in Smoke and Fog on Highway 2, north of Leduc Alberta, dated November 18, 1987.

Lac du Bonnet, December 2, 1987

14. P. Yule-Charles, citizen of the Municipality of Lac du Bonnet, Submission, Investigation of Farm Burning Practices, dated December 2, 1987.

15. Richard Howard, Demographic Map of Manitoba.

16. Supporting Papers RE: Manitoba Demographics, Ages of Manitoba Farmers, Farm Population and the Number of Farms.

Rossburn, December 7, 1987

1. Rural Municipality of Dauphin, Permit to Burn, a blank form.

2. Reeve Bob Witty, Rural Municipality of Russell, Brief, Agricultural Burning Practices, dated December 7, 1987.

3. Reeve John Mitchell, Rural Municipality of Rossburn, Brief, Agricultural Burning Practices, dated December 7, 1987.

EXHIBITS FORWARDED TO COMMISSION

1. The Clean Environment Commission advertisement of the hearings on agricultural burning practices in Manitoba.

2. Terms of Reference of the hearings.

3. Manitoba Department of Agriculture submission to the Clean Environment Commission on peat burning.

4. Facts About Straw Burning - a letter sent by the Department of Agriculture to farmers in the fall of 1987.

5. Operational Guidelines - Department of Natural Resources - Burning permits for peat areas - issued November 9, 1984.

6. Extensive Brief with recommendations on the practices of stubble burning submitted by the Keystone Agricultural Producers, November 20, 1987.

7. Letter dated November 5, 1987 from Mrs. N. Cullen of Lorette, outlining straw management practices and difficulties with recommendations for controls.

8. Report on the Utilization and Management Practices of Some Burned and Non-Burned Peat Soils in the Eastern Region - by F. Kebernik and L. A. Michalski - September, 1977.

9. Introduction to Peat Soil Management Fact Sheet - Department of Agriculture - 1987.

10. Brief - Investigating Farm Burning Practices on the influence of weather systems on atmospheric conditions and the problems of smoke covering the highways in the Pinawa area by AECL dated December 2, 1987.

11. Letter from Roberta Carlson of Lac du Bonnet dated November 30, 1987 relating accidents and highway hazards in the vicinity of Lac du Bonnet resulting from smoke from peat fires; letter from Dr. Craig, Principal of Lac du Bonnet Elementary Schools to Roberta Carlson - Also an attached petition containing over 700 names objecting to the burning of peat and requesting the Clean Environment Commission to hold public hearings to address this matter.

12. Letter dated October 21, 1987, with attached petition against burning submitted by G. Bissonnette, Key Safety Representatives, Manitoba Hydro Safety Department, Great Falls.

13. Letter dated October 13, 1987 from Ducks Unlimited Canada with concerns about waterfowl habitat subjected to burning.

EXHIBITS FORWARDED TO COMMISSION (continued)

14. Letter dated October 30, 1987 from the Secretary-Treasurer of the Town of Morden with attached submission to the Commission, signed by the Mayor, addressing agricultural aspects of straw burning as well as pointing out concerns of the hazard to highway transportation that result from smoke.

15. Letter dated December 23, 1987 from Manitoba Pool Elevators with a resolution from the board of directors opposing any new legislation to prohibit burning.

16. Letter dated October 7, 1987 from M. G. Wright, General Manager, Whiteshell Research, Atomic Energy of Canada, Pinawa to Dr. Thomas Owen, Deputy Minister of the Environment Department on the subject of smoke and atmospheric radioactivity.

17. Letter dated December 4, 1987, from D. T. Dixon, Manager, Whiteshell Nuclear Research Establishment, Atomic Energy of Canada Limited, Pinawa, to the Commission addressing atmospheric studies and measurements carried out at Pinawa, and attaching a booklet "Physical Behavior of Radioactive Contaminants in the Atmosphere" from the International Atomic Energy Agency, Vienna, 1974.

18. Letter dated October 22, 1987 from a number of concerned farmers in the area of the R.M. of MacDonald addressing burning practices and advocating that burning must be an option that is left open to the farmers.

19. Letter dated November 20, 1987 from the Headingley Correctional Institute, Workplace Health and Safety Committee, outlining concerns about and problems experienced as a result of smoke.

20. Letter from the Village of Lac du Bonnet of December 14, 1987 providing information on highway closures resulting from smoke.

21. Letter from K. Atkinson, Winnipeg, received December 4, 1987, relating medical reactions to smoke encounters.

22. Letter dated January 2, 1988 from Dorothea Rath and Berthold Skacel, Lac du Bonnet opposing the burning of peat.

23. Letter dated October 5, 1987 from R. Jennings, Manager, Airport Operations, Department of Transport, Winnipeg, advising that there are no identified instances where farm burning has affected operations at Winnipeg International Airport.

24. Letter from D. G. Henderson, Commissioner of Planning, City of Winnipeg, dated October 30, 1987 with authorization from the Planning & Community Services for the Commissioner to make representation to the Clean Environment Commission hearings on stubble burning (copy of the presentation attached).

EXHIBITS FORWARDED TO COMMISSION (continued)

25. 1985 Map of Peatland (Eastern Manitoba) - Prepared by Manitoba Agriculture.

26. Letter with enclosed brief on residue burning from a soil conservation perspective, from P. E. Fehr, Head Soil Conservation Planning, PFRA, Regina, dated October 27, 1987.

27. Exhibits from Environment Canada, Atmospheric Environment Services as follows:

Hosler C. R. Low Level Inversion Frequency in the Contiguous United States, Monthly Weather Review, September, 1961.

Atmospheric Environment Services Principal Station Data (a summary of weather observations), Winnipeg International Airport, 1983.

Einarsson E., Fraser H. M., Atmospheric Environment Service, Peat Fire Weather in Manitoba, 1976.

28. Map of Southern Wooded District, Manitoba Surveys and Mapping Branch, 1978.

29. Letter with accompanying presentation opposing burning of crop residue from N. J. Williamson, Winnipeg dated October 18, 1987.

30. Letter with accompanying resolution relating to burning of stubble from E. J. Lawrin, Secretary-Treasurer, Rural Municipality of Tache dated October 1, 1987 submitted on behalf of Council.

31. Letter from B. E. McMartin, Acting Director, Highway Safety, Manitoba Highways, dated October 5, 1987, referencing changes to be made to Driver's Handbook on "driving in smoke".

32. Letter from W.J. Dousett, Criminal Operations, RCMP, dated October 23, 1987 referencing reports on the highway hazard of smoke from Manitoba detachments in the smokey areas.

33. Letter from A. Beachell of the Union of Manitoba Municipalities, dated September 2, 1987 asserting that the Union consider some straw burning absolutely necessary with a strong request not to legislate against burning.

34. Letter from R.C. Willett, Board Chairman, Pine Falls General Hospital, dated October 2, 1987 with concerns about highway safety and health from peatland burning.

EXHIBITS FORWARDED TO COMMISSION (continued)

35. Letter from J. E. W. Wylie, Safety Manager, Manitoba Public Insurance Corporation concerning smoke caused possibility of problems on highways and the provisions of the Highway Traffic Act, dated March 17, 1988.